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| 10/763,260      | 01/26/2004  | Gunnar Brandt        | 029777-017          | 6474             |

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| EXAMINER |
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DANIELS, MATTHEW J

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| ART UNIT | PAPER NUMBER |
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1732

DATE MAILED: 05/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/763,260

Applicant(s)

BRANDT, GUNNAR

Examiner

Matthew J. Daniels

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– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 26 January 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-41 is/are pending in the application.
- 4a) Of the above claim(s) 33-41 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1/26/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Election/Restrictions*

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-32, drawn to a method of manufacture, classified in class 264, subclass 641.
  - II. Claims 33-41, drawn to a composite, classified in class 501, subclass 95.3.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product may be made by hot isostatic pressing.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.
4. During a telephone conversation with Alan Kopecki on April 19, 2005 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-32. Affirmation of this election must be made by applicant in replying to this Office action. Claims 33-41 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

***Information Disclosure Statement***

5. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

***Claim Rejections - 35 USC § 112***

6. Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In this case, it is not clear whether the Applicant intends to claim that the current: a) travels directly through the workpiece (current transmitted by the workpiece); b) travels through impurities in the workpiece; or c) travels through physical conduction paths of the pressure transmitting medium through holes or gaps in the workpiece.

7. Claim 11 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear whether Applicant intends for this claim to be limitless as to the upper heating rate, or whether a particular upper heating rate was intended, but not claimed.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. **Claims 1-19, 22-32** are rejected under 35 U.S.C. 103(a) as being unpatentable over Goldberger (USPN 5348694) in view of Yang (USPN 6417126) and Shen (J. Am. Ceram. Soc., Vol. 85, Num. 8, pg. 1921-1927). **As to Claim 1**, Goldberger teaches a method comprising the steps of forming a mixture (1:15-16) into a preformed workpiece (2:8-18); heating the workpiece at a heating rate of 50 degrees C/min (4:26) to a sintering temperature above 2000 degrees C (3:34-37). Goldberger appears to be silent to the other claimed limitations, namely the following:

- a) milling and mixing powders of alumina and silicon carbide whiskers
- b) holding the workpiece at the sintering temperature for a holding time of from about 5 to about 60 minutes at a pressure between 20 to 100 MPa.

However, these limitations are prima facie obvious for the following reasons:

- a) Yang teaches milling and mixing powders of alumina and silicon carbide whiskers (2:61-64) and sintering at 1900 C (10:61-62). Yang additionally teaches that every 1% increment of density above a density of 97% can dramatically increase the structural properties of the fired composite (7:18-23).

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b) Shen teaches holding the workpiece at the sintering temperature for a holding time of from about 5 to about 60 minutes at a pressure between 20 to 100 MPa (See Pg. 1923, Fig. 4 for the time and *Pressure Effect* paragraph, right column). Shen additionally teaches an apparatus (Page 1921, Fig. 1) that appears to be highly similar to that of Goldberg (Fig. 1).

It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the methods of Yang and Shen into that of Goldberger in order to produce a cutting tool (Yang, 1:48-53) having a density of 99-100% (See Shen, Page 1924, Fig. 5), which Yang clearly suggests to be desirable because of the improvement in structural properties that would result (Yang, 7:18-23). **As to Claim 2**, Shen teaches spark plasma sintering (Title). In order for there to be a plasma generated within the workpiece and between the ceramic particles, there would have inherently been some current that passed through the workpiece in order to generate the plasma. In an alternative interpretation, Goldberger teaches turbine rotors (2:5) which would inherently have gaps between the blades in the rotors and a hole in the center for a shaft. As such, these gaps would provide a conduction path "through said workpiece." In a third interpretation, Goldberger teaches a binder which pyrolyzes to about 2% free carbon (7:26-32). It would have been prima facie obvious that this binder would pyrolyze to graphite, which is a known conductor and would provide conduction paths within the article. In any of these interpretations, the Applicant's claim is prima facie obvious over the prior art. **As to Claim 3**, Goldberger teaches an unpulsed current (8:17-20). **As to Claim 4**, Shen teaches pulsed current (See Page 1924, *Pulse-Sequence Effect*), which would have been obvious in order to increase the rate of densification. **As to Claim 5**, Goldberger teaches providing a bed

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comprising a bed material of electrically conductive flowable particles with a contained zone (Fig. 1, Items 54, 52, 16, and 22 and 6:59-62), placing the workpiece in the bed (Fig. 1, Item 56), applying a pressure to the bed (7:29-32), and heating up the workpiece by applying electrical energy to the electrically conductive, flowable particles within the heating rate (7:35-41 and 4:26). **As to Claim 6**, Goldberger teaches a bed of particles comprising graphite (4:50-55). **As to Claim 7**, Goldberger teaches spherical graphite (4:50-55). **As to Claim 8**, Yang teaches 1900 degrees C (3:45-60). **As to Claim 9**, Yang teaches 1900 degrees C (3:45-60). Shen additionally teaches that any temperature over 1300 degrees C leads to full densification (Pg. 1924, Fig. 5). **As to Claim 10**, Yang teaches a heating rate of 20 degrees C/min (3:52). Shen provides additional teaching of the heating rate as it affects density and grain size (Pg. 1924, Fig. 7). **As to Claim 11**, Shen teaches a heating rate from about 25 degrees C/min (Pg. 1924, Fig. 7). **As to Claim 12**, Yang teaches 10 to 30 minutes (3:55). **As to Claim 13**, Yang teaches 10 to 20 minutes (3:55). **As to Claim 14**, Yang teaches from about 15 minutes (3:55). **As to Claim 15**, Shen teaches 50 to 100 MPa (See *Pressure Effect*, Page 1923). **As to Claim 16**, Shen teaches 50 to 100 MPa (See *Pressure Effect*, Page 1923). **As to Claim 17**, Yang teaches a method wherein the composite material comprises alumina plus silicon carbide whiskers in a total proportion of at least 90 % by weight (4:38-50). Because all of the components (alumina, silicon carbide, and boron carbide) have densities between 2.4 and 4 grams/cubic centimeter, the weight fraction is approximately the same as the volume fraction, and therefore the applicant's claim would have been prima facie obvious. **As to Claim 18**, Yang teaches as much as 99% comprising alumina and silicon carbide whiskers (4:37-50). Because all of the components (alumina, silicon carbide, and boron carbide) have densities between 2.4 and 4 grams/cubic

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centimeter, the weight fraction is approximately the same as the volume fraction, and therefore the applicant's claim would have been prima facie obvious. **As to Claim 19**, in the method of Yang, silicon carbide whiskers (4:50) comprise about 5 to 15% by weight (4:42). Because all of the components (alumina, silicon carbide, and boron carbide) have densities between 2.4 and 4 grams/cubic centimeter, the weight fraction is approximately the same as the volume fraction, and therefore the applicant's claim would have been prima facie obvious. **As to Claims 22-29**, the Examiner takes the position that these limitations are article limitations. There is no method step claimed, and these limitations are therefore not given patentable consideration in examination of the method. However, by disclosing that the temperature ramp rate (See Pg. 1923, *Heating-Rate Effect*, and Fig. 7), sintering time (Fig. 4), pressure (See Pg. 1923, *Pressure Effect*), and sintering temperature (Fig. 5) can each be modified, Shen teaches that all of these parameters appear to reflect result-effective variables, which can be optimized to minimize the grain size (See entire document). Therefore, it would have been prima facie obvious to one of ordinary skill in the art to optimize and select conditions which produced alumina grain sizes having a mean diameter or 80<sup>th</sup> percentile of less than 0.9 microns, as claimed in Claims 22-29, through routine experimentation of the temperature ramp rate, sintering time, pressure, and sintering temperature. See MPEP 2144.05 II and *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). **As to Claims 30-32**, Yang teaches magnesia or yttria (7:63) as a sintering aid in a proportion of from about 0.01 to about 5%, 0.02 to about 1%, and 0.03 to about 0.5% (each is encompassed by "an amount up to and including 5 wt % of the composition," Yang 7:65-66).



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9. **Claims 20-21**, are rejected under 35 U.S.C. 103(a) as being unpatentable over Goldberger (USPN 5348694) in view of Yang (USPN 6417126) and Shen (J. Am. Ceram. Soc., Vol. 85, Num. 8, pg. 1921-1927), and further in view of Brandt (USPN 5418197). Goldberger, Yang, and Shen teach the subject matter of Claims 1 and 19. See the rejection of Claims 1 and 19 under 35 USC 103(a). **As to Claim 20**, Goldberger, Yang, and Shen are silent to the claimed limitation. However, Brandt teaches 10% to 50% by volume of homogeneously dispersed whiskers of silicon carbide (3:3-7). It would have been prima facie obvious to incorporate the method of Brandt into that of Goldberger, Yang, and Shen because doing so would lead to a greatly improved fracture toughness and strength (1:59). Brandt also appears to suggest the combination because the method of Goldberger is pseudo-isostatic because of the bed of particles acts in an isostatic manner and uses a graphite tool, and Brandt suggests both an isostatic sintering method or pressure sintering in a graphite tool (3:39-42). **As to Claim 21**, Goldberger, Yang and Shen are silent to the claimed limitation. However, Brandt teaches 10% to 50% by volume of homogeneously dispersed whiskers of silicon carbide (3:3-7).

### ***Conclusion***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The Examiner cites the following as further indication of the state of the art at the time of the invention: Abstract from Gao et al (J. of the European Ceramic Society, Vol. 19, Num. 5, May 1999, pages 609-613), Becher (J. Am. Ceram. Soc., Vol. 71, Num. 12, 1988, pages 1050-1061), Mishra (Materials Science and Engineering, A287, 2000, 178-182), Prochazka (USPN 4209474), and Lowrance (USPN 5382405).

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Daniels whose telephone number is (571) 272-2450. The examiner can normally be reached on Monday - Friday, 8:00 am - 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Colaianni can be reached on (571) 272-1196. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MJD 5/5/05



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**SUPERVISORY PATENT EXAMINER**